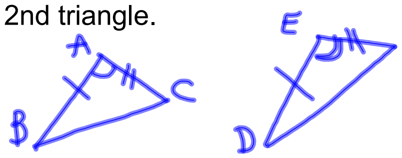
5.6 Inequalities in Two Triangles and Indirect Proof

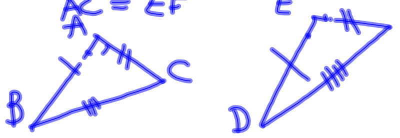
Theorem 5.13-Hinge Theorem--If 2 sides of one triangle are congruent to 2 sides of another triangle, and the included angle of the 1st triangle is greater than the included angle of the 2nd triangle, then the 3rd side of the 1st triangle is greater than the 3rd side of the 2nd triangle.



gsp demo

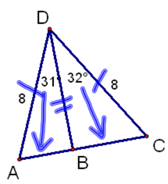
G: $\overline{AB} \cong \overline{DE}$; $\overline{AC} \cong \overline{EF}$ C: DF > BC
$m\angle E > m\angle A$

G: $\overline{AB} \cong \overline{DE}$ DF > BC Concl:
$\overline{AC} \cong \overline{EF}$ $m\angle E > m\angle A$



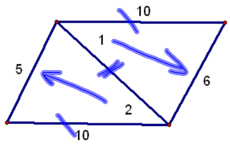
Theorem 5.14-Converse of the Hinge Theorem--If 2 sides of one triangle are congruent to 2 sides of another triangle, and the 3rd side of the 1st triangle is greater than the 3rd side of the 2nd triangle, then the included angle of the 1st triangle is greater than the included angle of the 2nd triangle.

Compare the listed sides or angles.



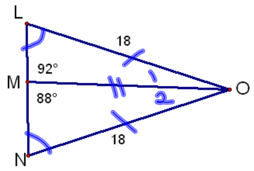
BC > AB

Compare the listed sides or angles.



m∠1 > m∠2

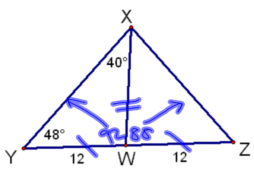
Compare the listed sides or angles.



LM < MN

m∠2 > m∠1
b/c more left n Δ

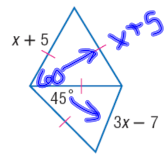
Compare the listed sides or angles.



XZ < XY

Write an inequality to describe the possible values of x.

5.



$x+5>0$
$x>-5$

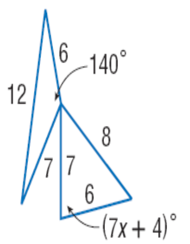
$3x-7>0$
$x>\frac{7}{3}$

$x+5>3x-7$
$12>2x$
$6>x$

$\frac{7}{3}<x<6$

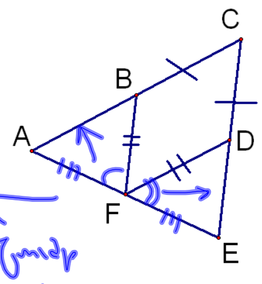
ty to describe the possible values of x.

6.



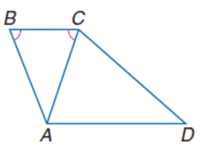
$-\frac{4}{7} < x < 19\frac{3}{7}$

Given: $\overline{BF} \cong \overline{DF}$; $\overline{BC} \cong \overline{CD}$;
F is the midpoint of AE;
m∠DFE > m∠AFB
Prove: CE > AC



① ~	① Given
② $\overline{AF} \cong \overline{FE}$	② def of midpt
③ DE > BA	③ Hinge thm
④ BC = CD	④ def of ≅
⑤ CD + DE > BC + BA	⑤ add.
⑥ CD + DE = CE BC + BA = AC	⑥ SAP
⑦ CE > CA	⑦ Subst.

38. **Given:** $\angle B \cong \angle ACB$
Prove: $AD + AB > CD$



Indirect Proof

1. Assume conclusion is false
2. Reason until you contradict the given
3. State assumption is false

Also called proof by contradiction.

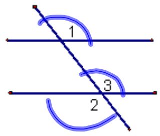
Example 1
Given: Mary received an A on the test.

Prove: Her grade was $\geq$90%.

Assume Mary earned an 89.
Then she would have received a B, which contradicts our given.
Our assumption is false, Mary's grade was $\geq$ 90%.

Example 2
Given: $\angle 1 \ncong \angle 2$

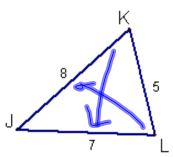
Prove: $\angle 1 \ncong \angle 3$



Assume $\angle 1 \cong \angle 3$.
then $\angle 3 \cong \angle 2$ b/c vert. $\angle$s are $\cong$
then by transitive $\angle 1 \cong \angle 2$
* Contradicts our given
$\therefore$ our assumption is false
$\angle 1 \ncong \angle 3$

Example 3
Given: picture

Prove: m$\angle$K < m$\angle$L



Assume $m\angle K > m\angle L$
by 5.11 $JL > JK$
* Contradicts our given
Assume $m\angle K = m\angle L$
by Conv. BAT $JL = JK$
* Contradicts given
Our assumptions are false
$\therefore$ $m\angle K < m\angle L$

Example 4

Given: $\frac{1}{2y + 4} = 20$

Prove: $y \neq -2$

HW p338-340
#s 1-9, 11-13, 16-18, 24

Attachments

Hinge_thm.gsp